NASA TECH BRIEF

Marshall Space Flight Center

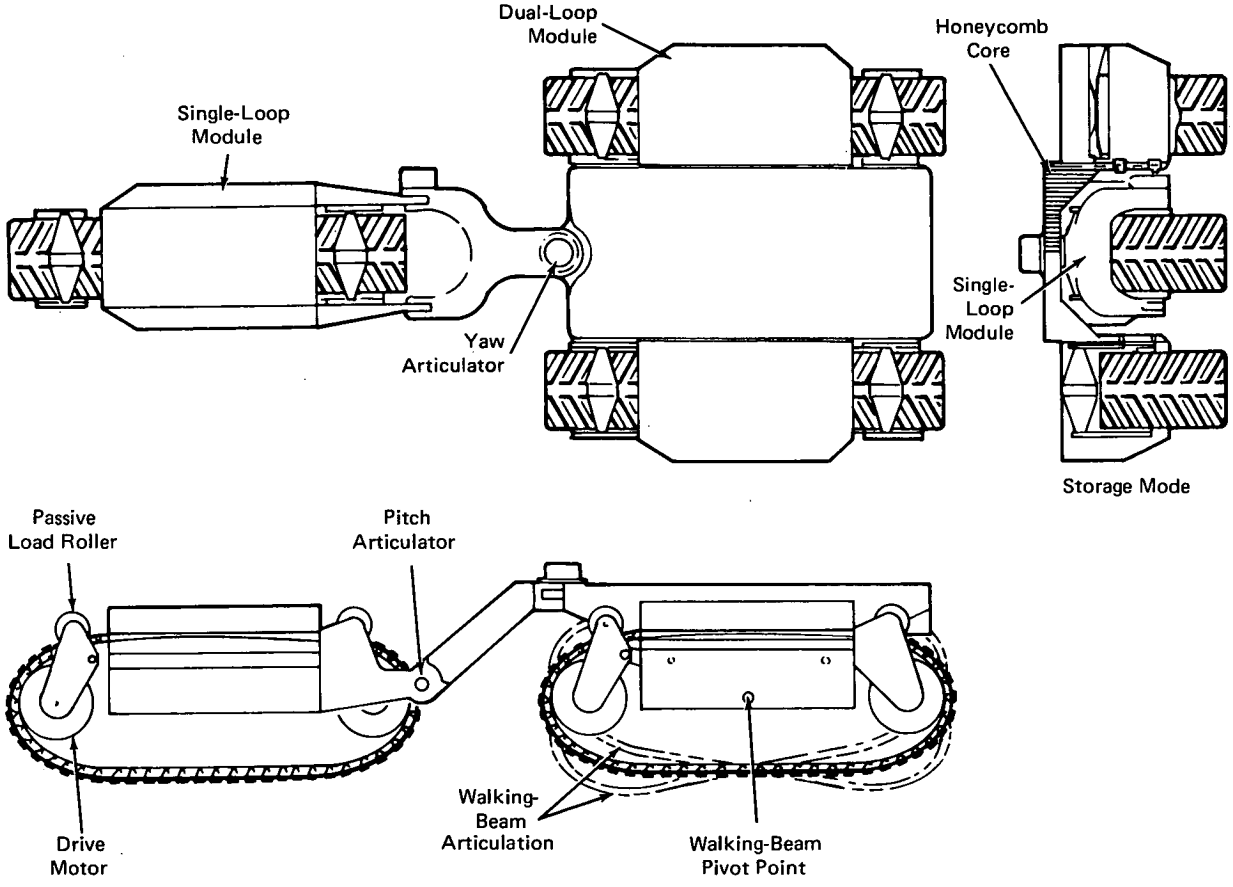
Articulated Elastic-Loop Roving Vehicles

The problem:

The scientific return from lunar and planetary missions can be increased by exploration of more terrain than is presently possible. Early wheeled rovers were limited in stability and could not negotiate difficult terrain.

The solution:

A prototype vehicle, called Elastic-Loop Mobility System (ELMS), features exceptional obstacle-negotiating and slope-climbing capabilities plus high propulsive efficiency.



Basic Layout of Three-Loop Articulated ELMS Roving Vehicle With Internal Electric Drive

(continued overleaf)

How it's done:

The ELMS is based on continuous elastic strips of high-strength metallic or fiber-reinforced composite material with transverse curvature, supporting the three-loop vehicle shown in the figure. It features pitch-and-yaw articulation between a single-loop module and dual-loop module. The pitch-and-yaw articulation members are powered and are used for horizontal-attitude and steering controls, respectively. The dual-loop module is equipped with a walking beam that pivots at the center of the module body. This permits the forward- and rear-loop rollers (one in each loop is motor driven) to move toward or away from the module body, in order to negotiate essentially vertical obstacles and to traverse crevasses.

Differential speed control of the three loops gives excellent maneuverability, so that bulldozing or sideslipping is negligible during the tightest turns possible. Turn radii of less than 1.4 vehicle lengths are possible by steering to sharper steering angles or by scuff steering the dual-loop module, while partially or fully lifting the single-loop module with the powered pitch-control system.

The ELMS is designed so that the single-loop module can be stored directly beneath the dual-loop module, between its two loops. This results in appreciable space saving for aerospace applications and also for long-distance over-the-road transportation by truck or trailer.

Notes:

1. The ELMS concept should interest designers of polar or ocean-bottom research vehicles. Also, its large footprint and low ground pressure will minimize ecological damage on terrain with low bearing strength, as in off-the-road applications.
2. Requests for further information may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Code A&PS-TU
   Marshall Space Flight Center, Alabama 35812
   Reference: B73-10326

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

Patent Counsel
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